

**Notice of Allowability****Application No.**

10/811,925

**Applicant(s)**

SHIBAYAMA ET AL.

**Examiner**

John Chavis

**Art Unit**

2193

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to papers filed 9/23/08.
2. ☒ The allowed claim(s) is/are 1-22.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some\* c) ☐ None of the:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.  
(a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached  
1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.  
(b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.  
**Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),  
Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413),  
Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_.

/John Chavis/  
Primary Examiner, Art Unit 2193

### EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Phillip Articola on 1/5/08.

2. The application has been amended as follows:

1. (Currently Amended) A program parallelization device including a processor comprising:  
a control/data flow analysis unit which analyzes the control flow and the data flow of a sequential processing program;  
a fork point candidate determination unit which determines the fork point candidates of the sequential processing program by referring to the results of the analysis of the control flow and the data flow by said control/data flow analysis unit;  
a parallel execution performance evaluation unit which evaluates, with respect to an input data, a parallel execution performance when the sequential processing program has been parallelized by a test combination of fork point candidates that were given;  
a best fork point candidate combination determination unit which generates a test combination of the fork point candidates that were determined by said fork point candidate determination unit, provides the test combination to said parallel execution

performance evaluation unit, and by taking the parallel execution performance of the test fork point candidate combination evaluated thereby as the reference, determines the best fork point candidate combination; and

a parallelized program output unit which generates and outputs a parallelized program by inserting a fork command at each fork point candidate of the best combination determined by said best fork point candidate combination determination unit,

wherein the program parallelization device transforms the sequential processing program into the parallelized program.

2. (Currently Amended) A program parallelization device including a processor comprising:

a control/data flow analysis unit which analyzes the control flow and the data flow of a sequential processing program;

a fork point candidate determination unit which determines the fork point candidates of the sequential processing program by referring to the results of the analysis of the control flow and the data flow by said control/data flow analysis unit;

a parallel execution performance evaluation unit which evaluates, with respect to an input data, a parallel execution performance when the sequential processing program has been parallelized by a test combination of fork point candidates that were given;

a best fork point candidate combination determination unit which generates a test combination only consisting of the combination of fork point candidates that can be simultaneously executed in the one-time fork model from the fork point candidates

determined by said fork point candidate determination unit, provides the test combination to said parallel execution performance evaluation unit, and by taking the parallel execution performance of the test fork point candidate combination evaluated thereby as the reference, determines the best fork point candidate combination;

a parallelized program output unit which generates and outputs a parallelized program by inserting a fork command at each fork point candidate of the best combination determined by said best fork point candidate combination determination trait:

wherein the program parallelization device transforms the sequential processing program into the parallelized program.

16. (Currently Amended) A computer ~~storage readable~~ medium embodying a computer program parallelization program that is executed on a computer causing,

a computer to operate as a control/data flow analysis function which analyzes the control flow and the dataflow of a sequential processing program;

a fork point candidate determination function which determines the fork point candidates of the sequential processing program by referring to the results of the analysis of the control flow and the data flow by said control/data flow analysis function;

a parallel execution performance evaluation function which evaluates, with respect to an input data, a parallel execution performance when the sequential processing program has been parallelized by a test combination of fork point candidates that were given;

a best fork point candidate combination determination function which generates a test combination of the fork point candidates that were determined by said fork point candidate determination function, provides the test combination to said parallel execution performance evaluation function, and by taking the parallel execution performance of the test fork point candidate combination evaluated thereby as the reference determines the best fork point candidate combination; and

a parallelized program output function which generates and outputs a parallelized program by inserting a fork command at each fork point candidate of the best combination determined by said best fork point candidate combination determination function.

17. (Currently Amended) A computer ~~storage readable~~ medium embodying a computer program parallelization program that is executed on a computer causing, a computer to operate as a control/data flow analysis function which analyzes the control flow and the data flow of a sequential processing program;

a fork point candidate determination function which determines the fork point candidates of the sequential processing program by referring to the results of the analysis of the control flow and the data flow by said control/data flow analysis function;

a parallel execution performance evaluation function which evaluates, with respect to an input data, a parallel execution performance when the sequential processing program has been parallelized by a test combination of fork point candidates that were given;

a best fork point candidate combination determination function which generates a test combination only consisting of the combination of fork point candidates that can be simultaneously executed in the one-time fork model from the fork point candidates determined by said fork point candidate determination function, provides the test combination to said parallel execution performance evaluation function, and by taking the parallel execution performance of the test fork point candidate combination evaluated thereby as the reference, determines the best fork point candidate combination;

a parallelized program output function which generates and outputs a parallelized program by inserting a fork command at each fork point candidate of the best combination determined by said best fork point candidate combination determination function.

18. (Currently Amended) The ~~program-parallelization-program-computer~~ storage ~~readable-medium~~ as set forth in claim 16,

wherein said parallel execution performance evaluation function generates a sequential execution trace when the sequential processing program was sequentially executed with the input data, divides the sequential execution trace by taking all the terminal point candidates as division points, analyzes thread element information for each thread element, and simulates parallel execution by units of thread element with respect to the test combination of the fork point candidates that were given to calculate the parallel execution performance.

19. (Currently Amended) The ~~program-parallelization-program-computer~~ storage  
~~readable-medium~~ as set forth in claim 16,

wherein said best fork point candidate combination determination function

constructs a better combination by ranking the fork point candidates determined by said fork candidate determination function in the order in which the fork point candidates are predicted to have an influence on parallel execution performance, and evaluating the parallel execution performance according to the order by taking the best fork point candidate combination at that time as the reference.

20. (Currently Amended) The ~~program-parallelization-program-computer~~ storage  
~~readable-medium~~ as set forth in claim 19,

wherein said best fork point candidate combination determination function

assuming that the combination of the fork point candidates including the prescribed numbers from the top in the order of the fork point candidates determined is an initial combination, evaluates the parallel execution performance of the initial combination with said parallel execution performance evaluation function, and sets the initial combination to the best fork point candidate combination at this time.

21. (Currently Amended) The ~~program-parallelization-program-computer~~ storage  
~~readable-medium~~ as set forth in claim 16,

wherein said best fork point candidate combination determination function

divides the collection of all the fork point candidates that have been determined by said fork point candidate determination function into fork point candidate groups in such a way that the fork point candidates have as little effects as possible on each other, generates a test fork point candidate combination for a group in the divided fork point candidate groups in which the best fork point candidate combination determination processing has not been performed, performs the best fork point candidate combination determination processing that determines the best fork point candidate combination by referring to the result of parallel execution performance of the test fork point candidate combination evaluated by said parallel execution performance evaluation function, and determines the sum of the best fork point candidate combinations, which are the processing results for each group, as the overall processing result.

22. (Currently Amended) The ~~program parallelization program~~ computer storage ~~readable~~-medium as set forth in claim 21,

wherein said best fork point candidate combination determination function calls the fork point candidate group partition processing taking the collection of all the fork point candidates determined by said fork point candidate determination function as a collection after the processing of said fork point candidate determination function has been completed, when the fork point candidate group partition processing is called, starts the group partition processing of the collection if the number of fork point candidates belonging to the given fork point candidate collection is higher than the designated division number lower limit, returns to the origin from where the fork point



candidate group partition processing was called without performing the group partition processing if the number of the fork point candidates is lower, divides from the collection the fork point candidate collections in which the number of fork point candidates that cancel themselves is higher than the designated number to generate a new group, further divides the collection into two groups, recursively calls the fork point candidate group partition processing taking one group as a collection and performs group partitioning of the group, recursively calls the fork point candidate group partitioning process taking the other group as a collection and performs group partitioning of the group, returns to the origin from where the fork point candidate group partitioning process was called, performs the best fork point candidate combination determination processing for the groups in which the best fork point candidate combination determination processing has not been performed among the groups of fork point candidates that were divided, determines whether the processing of all the groups has been completed, if there is a group that has not been processed, reiterates the best fork point candidate combination determination processing for the groups that have not been processed, and, when the processing of all the groups has been completed, outputs the sum of the fork point candidate combination, which is the result of processing for each group, as the overall result.

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Chavis whose telephone number is (571) 272-3720. The examiner can normally be reached on M-F, 9:00am-5:30pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lewis Bullock can be reached on (571) 272-3759. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/John Chavis/  
Primary Examiner, Art Unit 2193